

What is claimed is:

1. A method for handling wafers, the method comprising:
 - retrieving a first wafer from a storage position using a first arm,
 - transferring the first wafer from the first arm to a second arm,
 - delivering the first wafer for processing using the second arm to generate a processed wafer,
 - removing the processed wafer from processing using the first arm, and,
 - returning the processed wafer to the storage position using the first arm.
2. A method according to claim 1, where delivering includes delivering while retrieving a next wafer from the storage position using the first arm.
3. A method according to claim 1, further including orienting the first wafer prior to transferring the first wafer.
4. A method according to claim 1, further including processing the first wafer in a process chamber.
5. A method according to claim 4, where processing includes performing at least one of: photoresist, dry etch, ion implantation, chemical deposition, and diffusion.
6. A method according to claim 5, where processing includes at least one of orienting the next wafer and transferring the next wafer from the first arm to the second arm.
7. A method according to claim 1, where the storage position is in a wafer cassette and retrieving includes indexing the cassette.
8. A method according to claim 1, where the storage position is in a wafer cassette and returning the processed wafer to the cassette using the first arm includes indexing the cassette.
9. A method according to claim 2, where the storage position is in a wafer cassette and retrieving includes indexing the cassette.

10. A method according to claim 1, where returning the processed wafer using the first arm includes delivering the next wafer for processing using the second arm.
11. A method according to claim 1, where returning the processed wafer to the storage position using the first arm includes placing the second arm in a standby position.
12. A method according to claim 1, where transferring includes aligning the first arm and the second arm to facilitate the transfer of the first wafer from the first arm to the second arm.
13. A method according to claim 1, where transferring includes controlling an orienter to transfer the first wafer from the first arm to the second arm.
14. A method for handling wafers, the method comprising:
 - retrieving a first wafer from a wafer cassette using a first arm,
 - transferring the first wafer from the first arm to a second arm,
 - delivering the first wafer for processing using the second arm while retrieving a distinct next wafer from the wafer cassette using the first arm,
 - processing the first wafer to generate a processed wafer, while transferring the next wafer from the first arm to the second arm,
 - removing the processed wafer from processing using the first arm, and,
 - delivering the next wafer for processing using the second arm while returning the processed wafer to the cassette using the first arm.
15. A method according to claim 14, further including retrieving a distinct next wafer from the cassette using the first arm while processing the next wafer, and iteratively performing the processing, removing, and delivering.
16. A method according to claim 14, where processing includes performing at least one of: photoresist, dry etch, ion implantation, chemical deposition, and diffusion.

17. A method according to claim 14, where transferring includes controlling an orienter to transfer the first wafer between the first arm and the second arm.
18. A method according to claim 14, where retrieving includes indexing the cassette.
19. A method for processing wafers from at least two load locks, the method comprising:
 - processing wafers from a first wafer cassette in the first load lock, where the wafers are delivered for processing from the first wafer cassette using two arms,
 - performing load lock processing for at least a second load lock to obtain a processed load lock while processing the wafers of the first wafer cassette,
 - completing the processing of the first wafer cassette, and
 - processing wafers from a second wafer cassette in the processed load lock, where the wafers are delivered for processing from the second wafer cassette using two arms.
20. A method according to claim 19, further including performing load lock processing of the first load lock upon completion of processing of the first wafer cassette.
21. A method according to claim 19, further including:
 - performing load lock processing of the first load lock upon completion of processing of the first wafer cassette,
 - completing the processing of the second wafer cassette, and,
 - processing wafers from a replacement wafer cassette in the first load lock, where the wafers are delivered for processing from the replacement wafer cassette using two arms.
22. A method according to claim 19, where performing load lock processing includes performing at least one of evacuating, venting, isolation, cassette removal, cassette replacement, cassette installation, and lock valve control.

23. A system for handling wafers, the system comprising:
- a first arm for handling wafers,
 - a distinct second arm for handling wafers,
 - a first cassette of wafers, and,
 - a wafer processing system,
- where wafers are delivered to the processing system from the first cassette using the first arm and the second arm, and where the delivery includes,
- individually retrieving a first wafer from the cassette using the first arm,
 - transferring the first wafer from the first arm to the second arm,
 - delivering the first wafer for processing by the wafer processing system using the second arm,
 - processing the first wafer to generate a processed wafer, while retrieving a next wafer from the cassette using the first arm,
 - transferring the next wafer to the second arm,
 - removing the processed wafer using the first arm and delivering the next wafer for processing using the second arm,
 - processing the next wafer to generate a processed wafer while returning the processed wafer to the cassette, and
 - iteratively performing the processing, transferring, removing, and processing to process the wafers in the cassette.
23. A system according to claim 22, further including a first load lock for the first cassette.
24. A system according to claim 22, further including an orienter for orienting the wafers before processing and transferring the wafers between the first arm and the second arm.

25. A system according to claim 22, further including a platen for retrieving wafers from the second arm for delivering the wafers, and transferring processed wafers to the first arm for removing the processed wafers.
26. A method for handling wafers, the method comprising:
- retrieving a next wafer from a selected cassette using a first arm,
 - transferring the next wafer to a second arm,
 - removing a processed wafer from a process system using the first arm,
 - delivering the next wafer to the process system using the second arm, and,
 - returning the processed wafer to the selected cassette using the first arm.
27. A method according to claim 26, further including iteratively returning to retrieving.
28. A method according to claim 26, where transferring includes using an orienter to transfer the next wafer.
29. A method according to claim 26, further including orienting the processed wafer before returning.
30. A method according to claim 26, further including selecting a cassette prior to retrieving.
31. A method according to claim 26, further including determining whether unprocessed wafers remain in the selected cassette.
32. A method according to claim 31, including, when no unprocessed wafers remain in the selected cassette, performing at least one of: load lock processing associated with the selected cassette, and selecting a next cassette and iteratively returning to retrieving.
33. A method for handling wafers, the method comprising:
- retrieving a next wafer from a storage position using a first arm,
 - removing a processed wafer from processing using a second arm,
 - delivering the next wafer for processing,

returning the processed wafer to the storage position, and
iteratively performing the retrieving, delivering and returning while alternating using the
first arm and the second arm between iterations.

34. A method according to claim 33, where returning includes returning while processing the next wafer in a process chamber.

35. A method according to claim 34, where processing includes performing at least one of: photoresist, dry etch, ion implantation, chemical deposition, and diffusion.

35. A method according to claim 33, further including orienting the next wafer prior to delivering the next wafer.

36. A method according to claim 33, where the storage position is in a wafer cassette and retrieving includes indexing the cassette.

37. A method according to claim 33, where the storage position is in a wafer cassette and returning the processed wafer to the cassette includes indexing the cassette.

38. A method according to claim 33, where returning the processed wafer to the storage position using the second arm includes placing the first arm in a standby position.

39. A method for handling wafers, the method comprising:

retrieving a first wafer from a wafer cassette using a first arm while removing a processed wafer from processing using a second arm,

delivering the first wafer for processing,

returning the processed wafer to the wafer cassette while processing the first wafer to generate a processed wafer,

retrieving a next wafer from the wafer cassette using the second arm while removing the processed wafer from processing using the first arm,

delivering the next wafer for processing,

returning the processed wafer to the wafer cassette while processing the next wafer to generate a next processed wafer, and iteratively performing the retrieving, delivering and returning while alternating using the first arm and the second arm between iterations.

40. A method according to claim 39, further including orienting the first wafer prior to delivering the first wafer, and orienting the next wafer prior to delivering the next wafer.

41. A method according to claim 39, wherein retrieving includes indexing the cassette.

42. A method according to claim 39, where delivering the first wafer includes processing the first wafer in a process chamber, and delivering the next wafer includes processing the next wafer in a process chamber.

45. A method according to claim 42, where processing includes performing at least one of: photoresist, dry etch, ion implantation, chemical deposition, and diffusion.

46. A system for handling wafers, the system comprising:

a first arm for handling wafers,

a distinct second arm for handling wafers,

a first cassette of wafers, and,

a wafer processing system,

where wafers are delivered to the processing system from the first cassette using the first arm and the second arm, and where the delivery includes,

individually retrieving a first wafer from the cassette using the first arm,

delivering the first wafer for processing by the wafer processing system using the first arm,

returning a processed wafer to the cassette using a second arm while

processing the first wafer to generate a processed wafer,

retrieving a next wafer from the cassette using the second arm,
removing the processed wafer using the first arm and delivering the next wafer
for processing using the second arm,
processing the next wafer to generate a processed wafer while returning the
processed wafer to the cassette, and
iteratively performing the retrieving, delivering, returning, retrieving,
removing, and processing to process the wafers in the cassette.

- 47. A system according to claim 46, further including a first load lock for the first cassette.
- 48. A system according to claim 46, further including an orienter for orienting the wafers before processing.
- 49. A system according to claim 46, further including a platen for retrieving wafers from the first and second arms for processing the wafers, and transferring processed wafers to the first and second arms for removing the processed wafers.
- 50. A system according to claim 46, further including at least one carriage for moving the first and second arms relative to the cassette for returning and retrieving wafers from the cassette.